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DEVELOPMENT OF ANDROID-BASED INTERACTIVE LEARNING MEDIA TO IMPROVE COGNITIVE LEARNING OUTCOMES DEMONSTRATING CAM SOFTWARE FRAISING MACHINERY

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Abstract

This study aims to develop learning media so that it can be tested for feasibility, effectiveness, and practicality. This research was conducted using the Research and Development method. To determine valid and reliable learning media, a feasibility test was carried out by experts' assessment, and practicality according to students as users, then limited field trials used *True Experimental Design with* Simple two group research design Pre and Post Design. With the study population, namely students in class XII, the competence of expertise in Metal Fabrication and Manufacturing Engineering at SMK Negeri 7 Semarang consists of an experimental class and a control class, each class containing 30 students. The feasibility test results show that the media is very feasible to use. Data analysis used the t-test and N-Gain. Based on the results of the analysis it can be concluded that interactive learning media CAM milling machining is feasible to use, practicality tests in the very practical category are used and are more effective for improving student learning outcomes in learning CAM milling machining with an increase the average value is higher than the increase in the average value in the control class.

Keywords: Interactive learning media, milling machining CAM, learning outcomes.

INTRODUCTION

Vocational High School (SMK) is a formal education at the secondary education level that organizes vocational programs (Regulation of the Minister of Education and Culture Number 34 of 2018). Education with vocational programs can be a capital to build the younger generation so they are ready to face the world of work. There is a Metal Fabrication and Manufacturing Engineering expertise program at the SMK level. One of the competencies that must be mastered in this expertise program is demonstrating the function of commands in milling machining CAM software found in Non-Conventional Machining subjects.

CAM learning on milling machining is often delivered by educators using the lecture method accompanied by LCD projector displays. This has the disadvantage that it requires students to have good and fast comprehension, as well as memory. Batubara et al., (2017: 268) state that many students do not receive optimal learning with the lecture method. There are various causes, including lack of concentration, an atmosphere that is not conducive, memory power, and not all students have good and fast comprehension skills.

SMK Negeri 7 Semarang is one of the providers of formal education that provides competency skills in Metal Fabrication and Manufacturing Engineering. The results of observations related to learning using the lecture method were not enough to lead students to achieve their learning success. Especially in the basic competency of demonstrating the command functions of milling machining CAM software, there are still many students who score less than the KKM. So there needs to be a strategy/alternative to help students learn the material.

The problems above provide great potential for the development of learning media that can provide explanations regarding milling machining CAM software that can be learned even outside of class hours and outside the school computer lab. Sandman (2006: 40) states, that the proper use of educational media and varied can foster the active role of students, in this case, educational media is useful for increasing enthusiasm for learning, and enabling students to learn independently.

Table 1. Pure value of students demonstrating competency milling machining CAM software commands

Test	Value Acquisition ≥ 75	Value Acquisition < 75	The highest score	Lowest Value	Average Value	Information %
Pure grades of students	14	22	84	62	72,83	38.89%

The potential for developing Android-based interactive learning media is enormous considering that almost all students have personal devices. Learning applications can be installed and become student learning resources that can be opened anywhere and anytime. Arsyad (2013: 82) states, learning multimedia can be an alternative if learning tools are not available or difficult to reach, interactive learning multimedia can also overcome the limited number of instructors, and reach too many students when gathered in class. This is due to the conditions in the field, where most students can only study in the school's computer lab, while most students do not have sufficient computers to install CAM software.

Research conducted by Ramadhani (2020: 142) shows that the use of Android-based learning media can improve student learning outcomes for CAD learning. Based on this research, this study aims to develop learning media based on Android that has been tested for its feasibility in supporting milling machining CAM learning, especially in the basic competencies of demonstrating the functions of milling machining CAM software commands.

RESEARCH METHODS

The research method used is the method of research and development (Research and Development). This Research and Development (R&D) is used to develop and certify products (Sugiyono, 2015: 32). The development model used in this study is the Four-D Model (4D model) put forward by Thiagarajan 1974. Thiagarajan et al., (1974: 5) call the 4D development system approach divided into four instructional development processes, including Defining (Define), design (Design), development (Development), and dissemination (Disseminate).

The definition step (define) includes field observations. In line with the theory above, this scientific work also departs from the potentials and problems that have been found through literature studies and information gathering at SMK Negeri 7 Semarang. The potential for the development of interactive learning media appears to be a solution to existing constraints and problems. The second stage of product design (design), in this step is manifested in a product description in the form of a flowchart (flow chart) of the running of the application, and a storyboard (storyboard) which contains an overview of the appearance of the application.

The next step is development, making the design into a product and testing its validity, then testing it on small groups. Product validation tests will be carried out employing expert appraisals known as expert appraisals. Experts who will be asked to evaluate this interactive learning media are material experts and media experts. The results of the validation test will be feedback for product improvement. Products that have been revised based on expert/expert input and suggestions, then tested in a limited field. The field test will be carried out at SMK Negeri 7 Semarang. The research design used was the pre-test post-test trial design using the True Experimental Design in the form of the Pre-test Post-test Control Group Design.

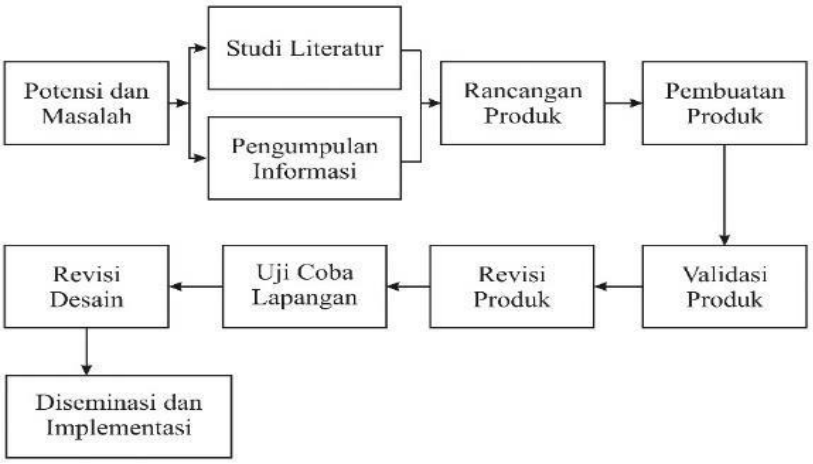

Figure 1. Research and development steps

Table 2. Experiment Design Pre-test Post-test Control Group Design

	Group	*Pre-test*	*Treatment*	*Post-test*
R	E	O1	X	O2
R	K	O3		O4

(Sugiyono, 2015: 504)

Information:
- R: *Randomized*
- E: Experiment Class
- K: Control Class
- O1 : *Pre-test*experimental class
- O2 : *Post-test*experimental class
- O3 : *Pre-test*control class
- O4 : *Post-test*control class
- X: Treatment using interactive learning media

Data analysis used an independent sample t-test with the help of IBM SPSS Statistics 26 and N-Gain applications.

RESULTS AND DISCUSSION

The results of the material feasibility test that has been carried out by 3 material expert validators consisting of one lecturer and 2 vocational teachers who are experts in the field of CNC. Obtained a feasibility value of 91.11% with the eligibility criteria "very feasible". The results of the material feasibility test can be seen in Table 3 below.

Table 3. Material Feasibility Test Results

Validators	Total score	Percentage
I	52	86.67%
II	55	91.67%
III	57	95%
Ideal score	60	

Total score obtained	164
The ideal score	180
Eligibility value	91.11%
Eligibility criteria	Very Worth it

The results of the media feasibility test can be seen in Table 4 below.

Table 4. Media Feasibility Test Results

Validators	Total score	Percentage
I	70	87.5%
II	72	90%
III	68	85%
Ideal score	80	

Total score obtained	210
The ideal score	240
Eligibility value	87.5%
Eligibility criteria	Very Worth it

The media feasibility test was carried out by 3 media expert validators consisting of one lecturer, 1 vocational school teacher, and 1 media expert staff of the Education and Culture Multimedia Development Agency (BPMPK). Obtained a feasibility value of 87.5% with eligibility criteria "highly feasible".

Table 5. Independent Sample T Test Pre-test Results

		Levene's Test for Equality of Variances						
		t	***df***	***Sig. (2-tailed)***	***Mean Differences***	***std. Error Difference***	***95% Confidence Interval of the Difference***	
							Lower	***Upper***
Pre-test results	*Equal variance assumed*	.506	58	.615	1.07100	2.11682	-3.16628	5.30828
	Equal variances not assumed	.506	55,936	.615	1.07100	2.11682	-3.16961	5.31161

Based on the results of the pre-test in the experimental and control classes, it is known that the data using the independent sample t-test obtained a significance value of 0.615 (Table 5). Because 0.615 > 0.05 then H0 is accepted and Ha is rejected. So it can be interpreted that the initial abilities of the two classes are the same.

Based on the post-test results in the experimental and control classes, it is known that the data are normally distributed and homogeneous. Then by using the independent sample t-test about the equal variances assumed (because it is homogeneous), the t-count value is 5.864 and the significance value is 0.000 (Table 6). Because the t-count value is 5.864 1.67 (t-table value at a significance level of 5%) then based on the right-hand side test, Ha is accepted and H0 is rejected. So it can be concluded that there is a significant difference in the learning outcomes of the two classes where the experimental class has a more positive increase than the control class. ≥Furthermore, the results of the pre-test and post-test of the experimental class and the control class are calculated to find out the increase in the value obtained. In the experimental class, the average increase was 76.71% while in the control class, the increase was 50.26% as shown in table 7. So the difference in the average increase for the two classes was 26.45%.

Based on the results of the practicality test of the interactive learning media given to the experimental class students, the practicality value was 87.02%, the practicality level of the learning media can be interpreted in the category of "very practical" for use in the learning process competency demonstrating the functions of milling machining CAM software commands.

The results of the descriptive analysis based on the pre-test and post-test scores of the experimental class students who used interactive learning media showed that there was an increase in learning outcomes. This increase in results occurs because the use of learning media will provide real visualization and involve several senses so that when using it students will find it easier to imagine or get an image and be more interactive (Mujiarto et al., 2019: 313).

Table 6. Independent Sample T Test Post-test Results

		Levene's Test for Equality of Variances						
		t	***df***	***Sig. (2-tailed)***	***Mean Differences***	***std. Error Difference***	***95% Confidence Interval of the Difference***	
							Lower	***Upper***
Student learning	*Equal variances*	5,864	58	.000	11.90467	2.03004	7.84110	15.96824

The increase in student learning outcomes in the experimental class was higher than in the control class. This can be seen from the learning outcomes of the control class which has a low average value. The average value of the experimental class is higher because the message or material to be conveyed to students can be conveyed better with the help of learning media (Bandono, 2020: 324). Learning media can also stimulate students' interest in learning, interactive media can generally involve students in the learning process, this occurs with interactions between students and learning media (Eze et al., 2020: 273). If the learning process is only in one direction, it will make students passive and bored to follow it, this often happens in learning using the lecture method.

Table 6. Average Pre-test and Post-test Results

	Pre-test results	**Post-test results**	***N-Gain score*(%)**
Experiment Class	52.98	89.05	76.71%
Control Class	54.04	77,14	50.26%

The learning media that has been used is then assessed by students in the experimental class to determine the level of practicality of the media through a questionnaire, the results of which are presented in Table 8.

Table 8. Media Practicality Test Results

Amount Student	Total score Obtained	Total Ideal Score	Mark Practicality (%)
30	731	840	87.02%
Eligibility category			Very Worth it

The results of the t-test analysis of the experimental and control classes also showed

that there was an increase in the learning outcomes of milling machining CAM software between students who used learning media and those who did not. These results corroborate the results of the previous descriptive analysis that the increase in learning outcomes in the experimental class was higher than in the control class due to the use of instructional media, given the same initial abilities. In line with the research of Khumaedi et al., (2021: 621) learning accompanied by interactive multimedia based on Android provides significantly different learning outcomes compared to conventional learning using the lecture method.

The results of the study show that the use of interactive learning media based on Android is one way to utilize learning media and technology to attract students' interest in learning. So that the achievement of the material being taught can be achieved optimally. The results showed that the use of instructional media had a positive effect on student learning outcomes in the basic competence of demonstrating the functions of milling machining CAM software commands.

CONCLUSIONS AND SUGGESTIONS

Conclusion

Based on the results of the discussion the following conclusions are drawn:

1. The learning media developed are "very feasible" to be used in the milling machining CAM learning process.
2. The use of interactive learning media has proven to be effective in improving student learning outcomes in the basic competency of demonstrating the function of milling machining CAM software commands.
3. The developed learning media is practically used according to student assessments as users.

Suggestion

Future research is expected to be able to test the product with a wider trial sample in several schools so that the research results are closer to actual conditions. It is hoped that educators can utilize media that is developed optimally and students can use it as a learning resource.

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